

EXHIBIT

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CURRICULUM VITAE

FRED S. APPLE, Ph.D, DABCC, FACSM

VITAL STATISTICS

1. Date of Birth: June 1953, Troy, New York
2. Present Address:

Work:

Clinical Laboratories, P4
Hennepin County Medical Center
701 Park Avenue
Minneapolis, MN 55415
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EDUCATION

1. 1975, B.S., Rensselaer Polytechnic Institute, Biology, advisors: KT Potts, Ph.D and L Cleseri, Ph.D.
2. 1979, Ph.D., University of Minnesota, Chemistry, advisors: RF Borch, Ph.D., M.D. and CF Moldow, M.D. Thesis: "Manipulation of the fatty acid composition of mammalian plasma membranes in culture".

POSTGRADUATE TRAINING

1. Clinical Chemistry Postdoctoral Fellow, Washington University School of Medicine, Barnes Hospital, advisor: JH Ladenson, Ph.D., Division of Laboratory Medicine, July 1980 to June 1982.
2. Technical Consultant Fellow, University of Minnesota, advisor: RF Borch, Ph.D., M.D., Department of Chemistry, March to May 1980.

ACADEMIC - PROFESSIONAL POSITIONS HELD

1. Co-Medical Director, Clinical and Forensic Toxicology Laboratory, Hennepin Healthcare / Hennepin County Medical Center, 2019 to present (accredited: CLIA, CAP, CAP FUDT, Joint Commission).
2. Principal Investigator, Hennepin Healthcare Research Institute (HHRI) (formerly

Minneapolis Medical Research Foundation), CLIA Laboratory Director of Cardiac Biomarkers Trials Laboratory (CBTL), CLIA ID Number 24D2019908; 1982 - present.

3. Professor, University of Minnesota School of Medicine, Department of Laboratory Medicine and Pathology, July 1995 to present.
4. Forensic Toxicology Consultant, Hennepin County Medical Examiner's Office, 1982 to 2019.
5. Program Director, Clinical Chemistry COMACC Fellowship at Hennepin Healthcare / Hennepin County Medical Center, Department of Laboratory Medicine and Pathology, 2013 to 2018.
6. Program Co-Director, Clinical Chemistry COMACC Fellowship at Hennepin Healthcare / Hennepin County Medical Center, Department of Laboratory Medicine and Pathology, 2019 to present.
7. Consultant, Fred S. Apple PhD, LLC; Forensic & Clinical Toxicology & Chemistry, 1985 to present.
8. Medical Director of Clinical Laboratories, Hennepin County Medical Center, 1996 to 2018 (accredited: CLIA, CAP, CAP POCT, CAP FUDT, ABFT, Joint Commission).
9. Medical Director of Clinical Chemistry and Toxicology Laboratories, Hennepin County Medical Center, July 1982 to 2018 (Toxicology Lab: CAP FUDT and American Board of Forensic Toxicology (ABFT) accredited).
10. Medical Director Point of Care Testing, Hennepin County Medical Center, 1995 to 2018 (CAP accredited).
11. Medical Director, Whittier Clinic Laboratory of Hennepin County Medical Center, 2015 to 2018 (CLIA, COLA accredited lab).
12. Medical Director, Richfield Clinic Laboratory of Hennepin County Medical Center, 2003 to 2015 (COLA accredited lab).
13. Medical Director, Richfield Clinic Laboratory of Hennepin County Medical Center, 2003 to 2015 (CLIA, COLA accredited lab).
14. Professor, Department of Kinesiology, University of Minnesota, July 1995 to 2010.
15. Medical Director, HFA Clinical Laboratories, December 2001 to 2012.
16. Program Director, Clinical Chemistry COMACC Fellowship at University of

Minnesota School of Medicine, Department of Laboratory Medicine and Pathology, 1996 to 2012.

17. Medical Director, North Central (formerly Regional Kidney Disease Program) Renal Laboratory of Total Renal Care (Davita), November 1992 to 2001.
18. Associate Director, Department of Pathology Residency Program 1993 to 2000.
19. University of Minnesota Graduate School Faculty Member:
 - a) Clinical Laboratory Science 1985 to present;
 - b) School of Kinesiology and Leisure Studies, 1992 to 2010;
 - c) Microbiology, Immunology, and Cancer Biology (Molecular Pathobiology) 1995 to 2003
20. Associate Professor, Department of Kinesiology, University of Minnesota, 1992 - 1995.
21. Associate Professor U of Minnesota School of Medicine, Department of Laboratory Medicine and Pathology, July 1988 to June 1995.
22. Assistant Professor, University of Minnesota School of Medicine, Department of Laboratory Medicine and Pathology, July 1982 to June 1988.
23. Visiting Assistant Professor, Department of Chemistry, University of Wisconsin - River Falls, September to November 1979.

HONORS, AWARDS, FELLOWSHIPS

1. National Science Foundation Summer Fellowship in Chemistry, RPI, 1974.
2. National Chemical Honorary Society, PHI Lambda Upsilon, 1974.
3. NIH Research Training Grant, Washington University School of Medicine, 1980 to 1982.
4. Young Investigator Award, International Society for Clinical Enzymology, 1983.
5. Fellow, American College of Sports Medicine, FACSM, 1986.
6. Visiting Professor, Karolinska Institute, Physiology III, Stockholm Sweden, November 1989; Recipient of Swedish National Council for Sports Research Award.
7. Visiting Lecturer, Danish Society Clinical Chemistry, Copenhagen Denmark, September 1991.

8. AACC Outstanding Speaker Award, 1995, 1996, 1997, 1998, 2001, 2002, 2003, 2004, 2005, 2007, 2009, 2010, 2015, 2016, 2017.
9. 1997 Canadian Society of Clinical Chemists Traveling Lectureship.
10. Visiting Professor, Emory University School of Medicine, Department of Pathology and Laboratory Medicine; December 15, 2005.
11. Visiting Professor, Harvard University Brigham and Women's Hospital, Department of Pathology, February 17, 2006.
12. Teacher of the Year Award, Clinical Pathology Residents Program, Department of Laboratory Medicine and Pathology, University of Minnesota School of Medicine, 2006-2007.
13. Visiting Professor Lecturer, FDA Center for Drug Evaluation and Research (CDER), November 21, 2008.
14. AACC 2009 Outstanding Award for Selected Area of Research.
15. AACC 2011 Reiner Award of AACC Capital Section.
16. Visiting Professor, Northwestern University Medical School, Department of Pathology, February 6, 2012.
17. Visiting Professor, Chinese University of Hong Kong Medical School – Prince of Wales Hospital, April 9-13, 2012.
18. Visiting Professor, Mayo Clinic, Department of Laboratory Medicine and Pathology, April 10, 2014.
19. AACC 2018 Outstanding Contributions Through Service to the Profession of Clinical Chemistry.
20. Visiting Professor/Scientist, Universitat Autònoma, Hospital de Sant Pau Department of Laboratory Medicine Barcelona Spain, January - March 2019.
21. 2020 IFCC Distinguished Award for Contributions to Cardiovascular Diagnostics.
22. 2020 Canadian Society of Clinical Chemistry Award for Education Excellence.

CERTIFICATIONS

1. Diplomat, American Board of Clinical Chemistry, Clinical Chemistry, 1986, No.750.
2. Diplomat, American Board of Clinical Chemistry, Toxicology, 1988, No.59.

3. Board Eligible, American Board of Forensic Toxicology, 1988.

PROFESSIONAL SOCIETIES - AFFILIATIONS

1. American Chemical Society, since 1977
2. American Association for Clinical Chemistry, since 1980.
 - a. Associate Editor, Clinical Chemistry, 2001 to present.
 - b. Board of Editors, Clinical Chemistry, 1991 - 2000; Editorials Editor, 1996 - 2000.
 - c. Section Co-Editor, Questions and Answers, Journal of the IFCC- 1996-2002.
 - d. Board of Editors, Forensic Urine Drug Testing Newsletter, 1993-1995.
3. American College of Sports Medicine, since 1981; Fellow since 1986.
4. International Society of Clinical Enzymology, 1983.
5. American Academy of Forensic Sciences, since 1986, member.
6. Academy of Clinical Laboratory Physicians and Scientists, since 1991.
 - a. Executive Council Member-at-Large 1999-2002
 - b. President-Elect 2002-2003
 - c. President 2003-2004, Past President 2004-2005
7. National Committee for Clinical Laboratory Standards (NCCLS); Clinical Chemistry, 1991-1993.
8. American Board of Clinical Chemistry, Board of Directors, 1992-1998.
9. Society of Forensic Toxicology (SOFT), member since 2000.
10. IFCC, Committee Standardization Markers of Cardiac Damage, Member 1998-2003; Chair 2004-2009.
11. FDA Clinical Chemistry and Clinical Toxicology Devices Panel of the Medical Devices. Advisory Committee, Center for Devices and Radiological Health, 2004-2005.
12. Canadian Society of Clinical Chemists, since 2000.
13. Member, United States Anti-Doping Agency (USADA) Anti-Doping Review Board, 2003 to 2020.
14. Global Task Force for Universal Definition of Myocardial Infarction, member; 2004 to present.

15. Member Editorial Board – Clinical Proteomics, 2004 to 2007.
16. The Commission on Accreditation in Clinical Chemistry (COMACC), member Board of Directors, 2009 to 2011.
17. Institute of Medicine, Committee on Qualification of Biomarkers as Surrogate Endpoints of Chronic Disease, 2008- 2010.
18. IFCC, member ‘Committee (previously Task Force) on Clinical Applications of Cardiac Biomarkers (TF-CB), 2011 to 2016; Chair, 2017- present.
19. NHLBI Working Group: Tools and Technologies for Cardiovascular Research and Point of Care, June 2012.
20. Steering Committee, British Heart Foundation funded study, HighSTEACS: High-sensitive Troponin in the Evaluation of patients with Acute Coronary Syndrome: a randomized controlled trial. 2011 to present.
21. American Heart Association, Basic Cardiovascular Sciences Council. 2015 to present.

POSTDOCTORAL / GRADUATE / UNDERGRADUATE STUDENTS

1. Marc A. Rogers, Ph.D., 1984, School of Kinesiology and Leisure Studies, University of Minnesota; currently at University of Maryland.
2. Johanna W. Lampe, R.D., M.S., 1985, Department of Nutrition, University of Minnesota; currently at University of Washington.
3. Carole Schneider, Ph.D., 1986, School of Kinesiology and Leisure Studies, University of Minnesota; Assistant Professor, University of Northern Colorado.
4. Peter G. Davis, Ph.D., 1987, School of Kinesiology and Leisure Studies, University of Minnesota; currently at United States Olympic Committee.
5. Chin-Cheng Hsieh, Ph.D., 1994, School of Kinesiology and Leisure Studies, University of Minnesota; currently at National Hsinchu Teacher's University, Taiwan.
6. Ellen Voss, MT (ASCP), M.S., Clinical Laboratory Science, 1994, University of Minnesota. currently at St Jude Medical.
7. Judy Willoughby, Ph.D., 1996, School of Kinesiology and Leisure Studies, University of Minnesota; currently at University of Wisconsin - Superior.
8. Chuong Hoang, 3rd/4th year medical student University of Minnesota; recipient of

American Heart Association research award; October 1995 - June 1996; May-June 1997.

9. Emily Volmer, Minnesota AHA Undergraduate Research Assistant, July - August 1996.
10. Amy Berg, Minnesota AHA Undergraduate Research Assistant, July - August 1997.
11. Sara Lauer, Minnesota AHA Undergraduate Research Assistant, July - August 1998.
12. Ying Jie Chen MD, PhD candidate University of Minnesota, School of Kinesiology and Leisure Studies, 1999; currently at University of Minnesota School of Medicine.
13. Vincent Ricchiuti, PhD, Postdoctoral Research Fellow. June 1996 to June 1997, Clinical Chemistry Postdoctoral Fellow, July 1997 - June 1999; currently at Harvard University.
14. Gerswhin K. Davis MD PhD, Clinical Chemistry Postdoctoral Fellow, July 1999 - June 2001;
15. Lindsay Cheimeluski, MN AHA Undergraduate Research Assistant, June-August 2000-3.
16. Ricardo Bardales, Washington University undergraduate, July – August 2001.
17. Ryan Sykora, MN AHA Undergraduate Research Assistant, June - August 2001.
18. Adrine Chung, MN AHA Undergraduate Research Assistant, June - August 2002.
19. Alex Samuel, MN AHA Undergraduate Research Assistant, June - August 2004.
20. Emily Allex, MN AHA Undergraduate Research Assistant, June - August 2006.
21. Kristen Luckenbill PhD JD, Clinical Chemistry Postdoctoral Fellow. July 2006 to June 2008.
22. Kalen Olson PhD, Clinical Chemistry Postdoctoral Fellow. Sept 2008 to Aug 2010.
23. Zack Ross, Undergraduate Research Assistant, Hamilton College, May –August 2012.
24. Sara Love PhD, Clinical Chemistry Postdoctoral Fellow. July 2013 to June 2015.

25. Kathryn Katzung MD, Medical Toxicology Fellow, December 2013.
26. Olaia Rodriguez Fraga PhD, Hospital Universiratio La Paz, Madrid Spain, April-July 2013.
27. Beret Amundson St Olaf Rockswold Scholar, June-August 2014.
28. Danny Alexander Mohama, St Olaf Rockswold Scholar, June-August 2015.
29. Jorge Díaz-Garzón Hospital Universiratio La Paz, Madrid Spain, May-August 2016.
30. Ryan Hatch, St Olaf Rockswold Scholar, June-August 2016.
31. Mitchel Moe, St Olaf Rockswold Scholar, June-August 2017.
32. Ian Gunsolus PhD, Clinical Chemistry Postdoctoral Fellow. July 2016 to June 2018. Assistant Professor, Medical College of Wisconsin.
33. Peter Cunniff, St Olaf Rockswold Scholar, June-August 2018.
34. Jazmin Sunderland, St Olaf Rockswold Scholar, June-August 2019.

RESEARCH Laboratory at MMRF

Cardiac Biomarkers Trials Lab (CBTL), CLIA ID number – 24D2019908

1. Cardiac Biomarkers Trial Laboratory (CBTL):
 - a. Applications of cardiac and vascular biomarkers/assays for detection/rule out of myocardial infarction, myocardial injury, ischemic & inflammatory injury, reperfusion, & risk stratification and outcomes assessment in ACS, heart failure and vascular diseases.
 - b. Cost effective utilization of cardiac biomarker testing in patients presenting to rule in/rule out myocardial infarction and heart failure.
 - c. Clinicaltrials.gov studies
 - a. Use of TROponin In Acute coronary syndromes [UTROPIA] Trial NCT02060760)
 - b. COmparisoN of High-sensitivity Cardiac TRoponin I and T Assays' [CONTRAST] Trial (NCT03214029)
 - c. Safe Emergency Department discharGe Rate [SEIGE] NCT04772157
 - d. Use of High Sensitivity cArdiac Troponin in Ruling Out Emergency Patients with acutE Myocardial Injury and Infarction [SAFETY] NCT04280926
2. Biochemistry of Exercise & Myocardial and Skeletal Muscle Ischemia:
Dynamics of protein expression and mRNA alterations in human and animal

heart and skeletal muscle in response to exercise and muscle disuse & following acute and chronic ischemia.

3. Toxicology (HCMC):

Forensic/postmortem analysis and postmortem redistribution of drugs and ethanol in tissues, blood, vitreous humor; medical legal ethanol and drugs of abuse pharmacokinetics; ethyl glucuronide and ethyl sulfate testing.

RESEARCH REPORTS (peer-reviewed):

1. Potts KT, Dunlap WC, Apple FS. Photodimerization of some 1,2,4-triazo (4,3-a) quinoline and 1,2,4-triazolo (3,4-a) -isoquinoline derivatives. *Tetrahedron* 1977; 33: 1263-7.
2. Ladenson JH, Apple FS, Koch DD. Misleading hyponatremia due to hyperlipemia: a method dependent error. *Ann Intern Med* 1981; 95: 707-8.
3. Apple FS, Koch DD, Graves S, Ladenson JH. Relationship between direct potentiometry and flame photometric measurement of sodium in blood. *Clin Chem* 1982; 28: 1931-5.
4. Apple FS, Greenspan N, Dietzler DN. Elevation of creatine kinase BB in hospitalized patients: importance of distinguishing BB CK from MB CK. *Ann Clin Lab Sci* 1982; 12: 398-402.
5. Ladenson JH, Apple FS, Aguanno JJ, Koch DD. Sodium measurements in multiple myeloma: two techniques compared. *Clin Chem* 1982; 28: 2383-6.
6. Apple FS, McGue MK. Serum changes during marathon training. *Am J Clin Path* 1983; 79: 716-9.
7. Apple FS, Walker FC, Dietzler DN. Serum creatinine concentrations and the discrepancy between EMIT and GLC phenytoin levels. *Ann Clin Lab Sci* 1983; 13: 385 - 92.
8. Ladenson JH, Apple FS, Aguanno JJ, Koch DD. Natriumbestimmung bei multiplem myelom; ein vergleich zweier techniken. *G T Lab Med* 1983; 6: 176 - 81 (In German).
9. Apple FS, Rogers MA, Sherman WM, Ivy JL. Creatine kinase isoenzyme patterns in gastrocnemius muscle obtained from marathon runners. *Selected Topics in Clinical Enzymol* 1984; 2: 419 - 28.
10. Apple FS, Rogers MA, Sherman WM, Ivy JL. Comparison of elevated serum creatine kinase MB activities post marathon race and post myocardial infarction. *Clin Chim Acta* 1984; 138: 111 - 8.
11. Apple FS, Rogers MA, Sherman WM, Costill D, Hagerman F, Ivy JL. Profile of creatine kinase isoenzymes in skeletal muscles of marathon runners. *Clin Chem* 1984; 30: 413 - 6.
12. Yasmineh WG, Lewis L, Apple FS. Chromatographic behavior of immunoglobulin - creatine kinase on DEAE - Sephadex A - 50. *Clin Chim Acta* 1984; 144: 29-37.
13. Apple FS, Rogers MA, Sherman WM, Casal DC, Ivy JL. Creatine kinase MB isoenzyme adaptations in stressed human skeletal muscle. *J Appl Physiol* 1985; 59: 149-53.
14. Coe JI, Apple FS. Variation in vitreous chemical values due to instrumentation. *J*

Forens Sci 1985; 30: 828-35.

15. Rogers MA, Apple FS. Creatine kinase isoenzyme activities in men and women following a 42.2 Km race. Med Sci Sports Exer 1985; 17: 679-82.
16. Lampe JW, Slavin JL, Apple FS. Poor iron status of women runners training for a marathon. Intl J Sports Med 1986; 7: 111-4.
17. Apple FS, Rogers MA. Creatine kinase isoenzyme MM in skeletal muscle and plasma from marathon runners. Clin Chem 1986; 32: 41-4.
18. Apple FS, Bandt C, Prosch A, Erlandson G, Holmstrom V, Scholen J, Googins MK. Creatinine clearance: enzymatic vs Jaffe determinations of creatinine in plasma and urine. Clin Chem 1986; 32: 388-90.
19. Apple FS, Rogers MA. Skeletal muscle lactate dehydrogenase isozyme alterations in men and women runners. J Appl Physiol 1986; 61: 477-81.
20. Apple FS, Rogers MA. Mitochondrial creatine kinase activity alterations in skeletal muscle during long distance running. J Appl Physiol 1986; 61: 482-5.
21. Lampe JW, Slavin JL, Apple FS. Elevated serum ferritin concentrations in master runners after a marathon race. Internat J Vit Nutr Res 1986; 56: 395-8.
22. Lampe JW, Slavin JL, Apple FS. Effects of moderate iron supplementation on the iron status of runners with low ferritin levels. Nut Report Intl 1986; 34: 959-66.
23. Clarkson PM, Apple FS, Byrnes WC, McCormick KM, Trifletti P. Creatine kinase isoforms following isometric exercise. Muscle and Nerve 1987; 10: 41-4.
24. Apple FS, Rogers MA, Casal DC, Lewis L, Ivy JL, Lampe JW. Skeletal muscle creatine kinase MB alterations in women marathon runners. Eur J Appl Physiol 1987; 56: 49-52.
25. Apple FS, Sharkey SW, Werdick M, Elsperger J, Tillbury RT. Analysis of creatine kinase isoenzymes and isoforms in serum to detect reperfusion after acute myocardial infarction. Clin Chem 1987; 33: 507-11.
26. Schneider C, Stull GA, Apple FS. Kinetic characterization of human heart and skeletal muscle CK isoenzymes. Enzyme 1988; 39: 220-6.
27. Apple FS, Bandt CM. Liver and blood postmortem tricyclic antidepressant concentrations. Am J Clin Path 1989; 89: 794-6.
28. Apple FS, Hellsten Y, Clarkson PM. Early detection of skeletal muscle injury by assay of creatine kinase MM isoforms in serum after acute exercise. Clin Chem 1988; 34: 1102-4.
29. Apple FS, Rhodes MD. Enzymatic estimation of skeletal muscle damage by analysis of changes in serum creatine kinase. J Appl Physiol 1988; 65: 2598-2600.
30. Sharkey SW, Apple FS, Elsperger KJ, Tilsury RT, Miller S, Fjeldos K, Asinger RW. Early peak of creatine kinase - MB in acute myocardial infarction with a non-diagnostic electrocardiogram. Am Heart J 1988; 116:1207-11.
31. Apple F, Preese L, Bennett R, Fredrickson A. Clinical and analytical evaluation of two immunoassays for direct measurement of creatine kinase MB with monoclonal anti-CK-MB antibodies. Clin Chem 1988; 34: 2364-6.
32. Sharkey SW, Elsperger KJ, Murakami M, Apple FS. Canine myocardial creatine kinase isoenzyme response to coronary artery occlusion. Am J Physiol 1989; 256: H508-14.
33. Eastep SJ, Benson PJ, Preese LM, Apple FS. Factitiously high sodium activities on the Ektachem 400 owing to interferences by high gamma-globulin

concentrations. *Clin Chem* 1989; 35: 333-4.

34. Apple FS, Abraham PA, Rosono TG, Halstenson CE. Assessment of renal function by inulin clearance: comparison with creatine clearance as determined by enzymatic methods. *Clin Chem* 1989; 35: 312-14.
35. Apple FS, Tesch PA. CK and LD isoenzymes in human single muscle fibers in athletes. *J Appl Physiol* 1989; 66: 2717-20.
36. Apple FS. Postmortem tricyclic antidepressant concentrations: assessing cause of death using parent drug to metabolite ratio. *J Analyt Tox* 1989; 13: 197-8.
37. Apple FS, Roe SJ. Cocaine-associated fetal death in utero. *J Analyt Tox* 1990; 14:259-60.
38. Apple FS, Preese LM, Riley L, Gerken KL, VanLente F. Clinical and financial impact of a rapid CK-MB specific immunoassay on the diagnosis of myocardial infarction. *Arch Path Lab Med* 1990; 114: 1017-1020.
39. Sjodin B, Westing YH, Apple FS. Formation of oxygen free radicals during exercise. *Sports Med* 1990; 10: 236-54.
40. Lampe JW, Slavin JL, Apple FS. Iron status in active women: the effect of running a marathon on bowel function & gastrointestinal blood loss. *Int J Sport Med* 1991;12:173-9.
41. Sharkey SW, Murakami MA, Smith S, Apple FS. Canine myocardial creatine kinase isoenzyme redistribution three weeks after coronary occlusion: biochemical and ultrastructural correlates. *Circulation* 1991; 84: 333-40.
42. Apple F, Benson, P, Preese L, Eastep S, Heiler G, Bilodeau L. Lipase and pancreatic amylase activities in tissues and in patients with hyperamylasemia. *Am J Clin Path* 1991; 96: 610-4.
43. Apple FS, Hyde JE, Ingersoll AM, Stone J, Theologides A. Geographic distribution of xanthine oxidase, free radical scavenger, creatine kinase and lactate dehydrogenase enzyme systems in rat heart and skeletal muscle. *Am J Anat* 1991; 192: 319-23.
44. Apple FS. Acute myocardial infarction and coronary reperfusion: serum cardiac markers for the 1990s. *Am J Clin Path* 1992; 97: 217-26.
45. Nosaka K, Clarkson PM, Apple FS. Time course of serum protein changes after strenuous exercise of the forearm flexors. *J Lab Clin Med* 1992; 119: 183-8.
46. Apple FS. The creatine kinase system in overtrained runners. *Clin Physiol* 1992; 12: 1-6.
47. Bilodeau L, Grotte DA, Preese LM, Apple FS. Glycerol interference in serum lipase assay falsely indicates pancreas injury. *Gastroenterology* 1992; 103: 1066-7.
48. Balla G, Jacob HS, Balla J, Rosenberg M, Nath K, Apple F, Eaton J, Vercellotti GM. Ferritin: a cytoprotective antioxidant strategem of endothelium. *J Biol Chem* 1992; 267: 18148-53.
49. Schneider CM, Rogers MA, Lampe JW, Rhodes MC, Apple, FS. Serum creatine kinase isoenzyme measurements in master male and female marathon runners. *Sports Med Train Rehab* 1992; 3: 237-242.
50. Adams JE, Bodor GS, Davila-Roman VG, Delmez JA, Apple FS, Ladenson JH, Jaffe AS. Cardiac troponin I: A marker with high specificity for cardiac injury. *Circulation* 1993; 88:101-6.
51. Wu AHB, Valdes R, Apple FS, Gornet T, Stone MA, Mayfield-Stokes S, Ingersoll-

Stroibos AM, Wiler B. Cardiac troponin-T immunoassay for diagnosis of acute myocardial infarction. *Clin Chem* 1994; 40: 900-907.

52. Apple FS, Billadello JJ. Creatine Kinase M and B subunit mRNA levels in exercise trained rat skeletal muscle. *Life Sci* 1994; 55: 585-92.

53. Apple FS, Preese LM. Creatine kinase MB: detection of AMI and monitoring reperfusion. *J Clin Immunoassay* 1994; 17: 24-29.

54. Theologides A, Ingersoll-Stroubos AM, Apple FS. TNF - effect on oxygen free radical scavenging and generating enzymes in rat liver. *Biochem Mol Biol Internal* 1994; 33: 205-210.

55. Apple FS, Bilodeau L, Preese LM, Benson P. Clinical implementation of a rapid, automated assay for assessing fetal lung maturity. *J Reprod Med* 1994;39:883- 7.

56. Apple FS, Voss E, Lund L, Preese L, Berger CR, Henry TD. Cardiac troponin, CK-MB and myoglobin for early detection of acute myocardial infarction and monitor of reperfusion following thrombolytic therapy. *Clin Chim Acta* 1995; 237: 59-66.

57. Apple FS. Glycogen phosphorylase BB and other cardiac proteins: challenges to creatine kinase MB as the marker for detecting myocardial injury. *Clin Chem* 1995; 41: 13 - 5.

58. Voss EM, Sharkey SW, Gernert A, Murakami MA, Johnston RB, Hsieh CC, Apple FS. Human and canine cardiac troponin T and CK-MB distribution in normal and diseased myocardium: infarct sizing using serum profiles. *Arch Path Lab Med*, 1995; 119:799-806.

59. Apple FS, Sharkey SW, Henry TD. Early serum cardiac troponin I and T concentrations following successful thrombolysis for acute myocardial infarction. *Clin Chem* 1995; 41: 1197-8.

60. Bodor GS, Porterfield D, Voss E, Smith S, Apple FS. Cardiac troponin I is not expressed in fetal and adult human skeletal muscle tissue. *Clin Chem* 1995; 41: 1710 - 5.

61. Apple FS, Henry TD, Berger CR, Landt YV. Early monitoring of coronary reperfusion following thrombolytic therapy by measurement of cardiac troponin I, creatine kinase MB and myoglobin. *Am J Clin Path* 1996; 105: 6-10.

62. Apple FS, Wu AHB, Valdes R. Serum cardiac troponin T concentrations in hospitalized patients without acute myocardial infarction. *Scand J Clin Lab Invest* 1996; 56: 63-8.

63. McLaurin M, Apple FS, Henry TD, Sharkey SW. Cardiac troponin I and T levels in patients with cocaine associated chest pain. *Ann Clin Biochem* 1996;33:183-6.

64. Hellsten Y, Apple FS, Sjodin B. The effect of sprint cycle training on activities of antioxidant enzymes in human skeletal muscle. *J Appl Physiol* 1996; 81: 1484-7.

65. Apple FS, Lowe MC, Googins MK, Kloss J. Serum thiocyanate concentrations in normal and renal impaired patients receiving nitroprusside. *Clin Chem* 1996; 42: 1878-9.

66. Tucker JF, Collins RA, Anderson AJ, Hauser J, Kalas J, Apple FS. Early diagnostic efficiency of cardiac troponin I and cardiac troponin T for acute myocardial infarction. *Acad Emerg Med* 1997; 4:13-21.

67. Apple FS, Sharkey SW, Hoeft P, Skeate R, Voss EM, Dahlmeier BA, Preese LM. Prognostic value of serum cardiac troponin I and T in chronic dialysis patients: a one year outcomes analysis. *Am J Kid Dis* 1997; 29: 399-403.

68. Bodor GS, Survant L, Voss EM, Smith S, Posterfield D, Apple FS. Cardiac troponin-T composition in normal and regenerating human skeletal muscle. *Clin Chem* 1997;43:476-84.
69. McLaurin MD, Apple FS, Voss EM, Herzog CA, Sharkey SW. Serum cardiac troponin I, cardiac troponin T, and CK MB in dialysis patients without ischemic heart disease: evidence of cardiac troponin T expression in skeletal muscle. *Clin Chem* 1997; 43: 976-82.
70. Ricchiuti V, Zhang J, Apple FS. Cardiac troponin I and T alterations in hearts with severe left ventricular remodeling. *Clin Chem* 1997; 43: 990-5.
71. Hoang CD, Zhang J, Payne RM, Apple FS. Post-infarction left ventricular remodeling induces changes in creatine kinase mRNA and protein subunit levels in porcine myocardium. *Am J Pathol* 1997; 151: 257-64.
72. Apple FS, Falahati A, Paulson PR, Miller E, Sharkey SW. Improved detection of minor ischemic myocardial injury with measurement of serum cardiac troponin I. *Clin Chem* 1997; 43: 2047-51.
73. Christenson RH, Apple FS, Morgan DL, Alonsozana GL, Mascotti K, Olson M, McCormack RT, Wians FH, Keffer JH, Duh SH. Cardiac troponin I measurement on the Access immunoassay system: analytical and clinical performance characteristics. *Clin Chem* 1997; 44: 52-60.
74. Apple FS, Sharkey SW, Falahati A, Murakami MA, Mitha N, Christenson D. Assessment of left ventricular function using serum cardiac troponin I measurements following myocardial infarction. *Clin Chim Acta* 1998; 272: 59-67.
75. Henderson AR, Gerhardt W, Apple FS. Summary with extrapolations of a roundtable on the use of biochemical markers in the diagnosis and theory of monitoring of patients with ischemic heart disease. *Clin Chim Acta* 1998; 272: 93-100.
76. Wu AHB, Feng YJ, Moore R, Apple FS, McPherson PH, Buechler KF, Bodor G. Characterization of cardiac troponin subunit release into serum after acute myocardial infarction and comparison of assays for troponin T and I. *Clin Chem* 1998; 44:1198-1208.
77. Ricchiuti V, Sharkey SW, Murakami MA, Voss EM, Apple FS. Cardiac troponin I and T alterations in dog hearts with myocardial infarction: correlation with infarct size. *Am J Clin Path* 1998; 110: 241-7.
78. McLaurin MD, Apple FS, Falahati A, Murakami MA, Miller EA, Sharkey SW. Cardiac troponin I and creatine kinase MB mass to rule out myocardial injury in hospitalized patients with renal insufficiency. *Am J Cardiol* 1998; 82: 973-5.
79. Ricchiuti V, Voss EM, Ney A, Odland M, Anderson PAW, Apple FS. Cardiac troponin T isoforms skeletal muscle of renal diseased patients will not cause false positive serum results by the second generation cardiac troponin T assay. *Eur Heart J* 1998; 19 (suppl N): N30-3.
80. Apple FS, Ricchiuti V, Voss EM, Ney A, Odland M, Anderson PAW. Expression of cardiac troponin T isoforms expressed in renal diseased skeletal muscle will not cause false positive results by the second generation cardiac troponin T assay by Boehringer Mannheim. *Clin Chem* 1998; 44: 1919-24.
81. Falahati A, Sharkey SW, Christensen D, McCoy M, Miller E, Murakami MA, Apple FS. Implementation of cardiac troponin I for detection of acute myocardial injury in

an urban medical center. Am Heart J 1999; 137: 332-7; letter to editor correction 1999; 138: 798-800.

82. Apple FS, Christenson RH, Valdes Jr R, Andriak AJ, Duh SH, Feng YJ, Koplen B, Jortani SA, Johnson NA, Berg A, Mascotti K, Wu AHB. Simultaneous rapid measurement of whole blood myoglobin, creatine kinase MB, and cardiac troponin I by the Triage Cardiac Panel for detection of myocardial infarction. Clin Chem 1999; 45: 199-205.
83. Apple FS, Muren AJ, Mullins RE, Painter PC, Pessin-Minsley MS, Webster RA, Flores JS, DeCresce R, Fink DJ, Buckley PM, Marsh J, Ricchiuti V, Christenson RH. Multicenter clinical and analytical evaluation of the AxSYM troponin I immunoassay to assist in the diagnosis of myocardial infarction. Clin Chem 1999; 45: 206-12.
84. Sheng WS, Lin YC, Apple FS, Hy S, Peterson PK, Chao CC. Brain energy stores in C57BL/6 mice after c. parvum injection. Neuroreport 1999; 10: 177-181.
85. Wu AHB, Apple FS, Gibler WB, Jesse RL, Warshaw MM, Valdes Jr R. National academy of clinical biochemistry standards of laboratory practice: recommendations for use of cardiac markers in coronary artery diseases. Clin Chem 1999; 45: 1104-21.
86. Apple FS. Biochemical markers of thrombolytic success. Scand J Clin Lab Invest 1999; 59 (suppl 230) 60-6.
87. Panteghini M, Apple FS, Christenson RH, Dati F, Mair J, Wu AH. Proposals from IFCC committee on standardization of markers of cardiac damage (C-SMCD): recommendations on use of biochemical markers of damage in acute coronary syndrome. Scand J Clin Lab Invest 1999; 59 (suppl 230) 103-12.
88. Dati F, Panteghini M, Apple FS, Christenson RH, Mair J, Wu AH. Proposals from IFCC committee on standardization of markers of cardiac damage (C-SMCD): strategies and concepts on standardization of cardiac marker assays. Scand J Clin Lab Invest 1999; 59 (sup 230) 113-23.
89. Apple FS. Tissue specificity of cardiac troponin I, cardiac troponin T, and creatine kinase MB. Clin Chim Acta 1999; 284: 151-9.
90. Christenson RH, Vaidya H, Landt Y, Bauer RS, Green SF, Apple FS, Jacob A, Magneson GR, Nag S, Wu AHB, Azzazy HME. Standardization of creatine kinase MB (CK MB) mass assays: the use of recombinant CK MB as a reference material. Clin Chem 1999; 45: 1414-23.
91. Ricchiuti V, Apple FS. RNA expression of cardiac troponin T isoforms in diseased human skeletal muscle. Clin Chem 1999; 45: 2129-35.
92. Apple FS. Clinical and analytical standardization issues confronting cardiac troponin I. Clin Chem 1999; 45: 18-20.
93. Siegel AJ, Sholar MB, Mendelson JH, Lukas SE, Kaufman MJ, Renshaw PF, McDonald JC, Lewandrowski KB, Apple FS, Stec JJ, Lipinski I, Tofler GH, Ridker PM. Cocaine induced erythrocytosis and increase in von Willebrand factor. Arch Intern Med 1999; 159: 1925-30.
94. Wu AHB, Holtman V, Apple FS, Ricchiuti V, DiBello PM, Jacobsen D. Multicenter analytical evaluation of the automated IMx assay for total plasma homocysteine. Ann Clin Lab Sci 2000; 30: 185-90.
95. Apple FS. The specificity of biochemical markers of cardiac damage: a problem

solved. Clin Chem Lab Med 2000; 37: 1085-9.

96. Apple FS, Koplen B, Murakami MA. Preliminary evaluation of the Ortho ECi cardiac troponin I immunoassay. Clin Chem 2000; 46: 572-4.
97. Mackey-Bojack S, Kloss J, Apple FS. Cocaine, cocaine metabolites, and ethanol concentrations in postmortem blood and vitreous humor. J Anal Tox 2000; 24: 59-65.
98. Chen YJ, Serfass RC, Apple FS. Alterations in the expression and activity of creatine kinase-M and mitochondrial creatine kinase subunits in skeletal muscle following prolonged intense exercise in rats. Eur J Appl Physiol 2000; 81: 114-9.
99. Chen YJ, Serfass RC, Mackey-Bojack SM, Kelly KL, Titus JL, Apple FS. Cardiac troponin T alterations in myocardium and serum of rats following stressful, prolonged intense exercise. J Appl Physiol 2000, 88: 1749-55.
100. Chen YJ, Serfass RC, Apple FS. Loss of myocardial CK-MB into the circulation following 3.5 hours of swimming in a rat model. Int J Sports Med 2000; 21: 1-5.
101. Stelow EB, Johari VP, Smith SA, Crosson JT, Apple FS. Propofol-associated rhabdomyolysis with cardiac involvement in adults: chemical and anatomic findings. Clin Chem 2000: 46: 577-81.
102. Jaffe AS, Ravkilde J, Roberts R, Naslund U, Apple FS, Galvani M, Katus H. It's time for a change to a troponin standard. Circulation 2000, 102: 1216-20.
103. Apple FS, Anderson FP, Collinson P, Jesse RL, Kontos MC, Levitt MA, Miller EA. Clinical evaluation of the First Medical whole blood, point of care testing device for detection of myocardial infarction. Clin Chem 2000, 46: 1604-9.
104. Joint European Society of Cardiology/American College of Cardiology Committee (Apple FS member Biochemistry section). Myocardial infarction redefined-a consensus document of the Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of myocardial infarction. J Am Coll Cardiol 2000; 36: 959-69.
105. Joint European Society of Cardiology/American College of Cardiology Committee (Apple FS member Biochemistry section). Myocardial infarction redefined – a consensus document of the Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of myocardial infarction. Europ Heart J 2000; 21: 1502-13.
106. Miller R, Callas DD, Kahn SE, Ricchiuti V, Apple FS. Evidence of myocardial damage in mummified human tissue. JAMA 2000; 284: 831-2.
107. Ricchiuti V, Shear W, Henry TD, Paulson PR, Miller EA, Apple FS. Monitoring plasma cardiac troponin I for the detection of myocardial injury after percutaneous transluminal coronary angioplasty. Clin Chim Acta 2000; 302: 161-70.
108. Burt M, Anderson DC, Kloss J, Apple FS. Evidence based implementation of free phenytoin therapeutic drug monitoring. Clin Chem 2000; 46: 1132-5.
109. Beuerle JR, Azzazy H, Apple FS, Duh SH, Tan A, Christenson RH. Performance characteristics of a new myoglobin microparticle immunoassay: a multicenter evaluation. Clin Biochem 2000; 33: 595-8.
110. Apple FS, Murakami M, Panteghini M, Christenson RH, Dati F, Mair J, Wu AH. International survey on the use of cardiac markers. Clin Chem 2001; 47: 587-9.
111. Christenson RH, Duh SH, Apple FS, Bodor G, Bunk D, Dalluge J, Panteghini M, Potter J, Welch M, Wu AHB, Kahn S. Standardization of cardiac troponin I assays:

round robin performance of ten candidate reference materials. *Clin Chem* 2001; 47: 431-7.

112. Burt MJ, Kloss J, Apple FS. Postmortem blood free and total morphine concentrations in medical examiners cases. *J Forensic Sci* 2001; 46: 1138-42.
113. Christenson RH, Duh SH, Sanhai W, Wu AHB, Holtman V, Painter P, Branham E, Apple FS, Murakami MA, Morris DL. Characteristics of an albumin cobalt binding test for assessment of acute coronary syndrome patients: a multicenter study. *Clin Chem* 2001; 47: 464-70.
114. Apple FS, Wu AHB. Myocardial infarction redefined: role of cardiac troponin testing. *Clin Chem* 2001; 47: 377-9.
115. Davis GK, Labugger R, Van Eyk JE, Apple FS. Cardiac troponin T is not detected in Western blots of diseased renal tissue. *Clin Chem* 2001; 47: 782-4.
116. Panteghini M, Gerhardt W, Apple FS, Dati F, Ravkilde J, Wu AH. Quality specifications for cardiac troponin assays. *Clin Chem Lab Med* 2001; 39:175-9.
117. Davis G, Park K, Kloss J, Apple FS. Tricyclic antidepressant fatality: role of measuring postmortem tissue concentration. *J Toxicology* 2001; 39: 44-5.
118. Apple FS. Cardiac troponin assays: analytical issues and clinical reference range cutpoints. *Cardiovas Tox* 2001; 1: 93-8.
119. Herzog CA, Apple FS. Cardiac biomarkers in the new millennium. *Seminars Dial* 2001; 14: 322-3.
120. Wu AHB, Morris DL, Fletcher DR, Apple FS, Christenson RH, Painter PC. Analysis of the albumin cobalt binding (ACB) test as an adjunct to cardiac troponin I for the early detection of myocardial infarction. *Cardiovas Tox* 2001; 1: 147-52.
121. Frantz CR, Powell C, Karon B, Parvin CA, Hankins K, Dayal M, Sadovsky Y, Johari V, Apple FS, Gronowski AM. Assessment of the diagnostic efficiency of the TDx-FLM II to predict fetal lung maturity. *Clin Chem* 2002; 48: 761-5.
122. Uettwiler-Geiger D, Wu AHB, Apple FS, Jevans AW, Venge P, Olson MD, Darte C, Woodrum DL, Roberts S, Chan S. Analytical performance of Beckman Coulter's Access AccuTnI (troponin I) in a multicenter evaluation. *Clin Chem* 2002; 48: 869-76.
123. Apple FS, Wu AHB, Jaffe AS. European Society of Cardiology and American College of Cardiology guidelines for redefinition of myocardial infarction: how to use existing assays clinically and for clinical trials. *Am Heart J* 2002; 144: 981-6.
124. Apple FS, Quist WE, Mathews WE, Otto A, Murakami MM. Release characteristics of cardiac biomarkers and ischemia modified albumin as measured by the albumin cobalt binding test following a marathon race. *Clin Chem* 2002; 48: 1097-1100.
125. Knoblock R, Lehman C, Smith R, Apple FS, Roberts WL. False positive AxSYM cardiac troponin I result in a 59-year old woman. *Arch Path Lab Med* 2002; 126: 606-9.
126. Apple FS, Murakami MM, Jesse RL, Levitt MA, Collinson P. Risk assessment of patients with acute coronary syndromes utilizing a near bedside whole blood cardiac troponin I assay. *Clin Chem* 2002; 48: 1784-7.
127. Apple FS, Murakami MM, Pearce LA, Herzog CA. Predictive value of cardiac troponin I and T for subsequent death in end stage renal disease. *Circulation* 2002; 106: 2941-5.
128. Fishbein MC, Wang T, Matijaevic M, Hong L, Apple FS. An immunohistochemical

study in experimental models of myocardial ischemia. *Cardiovas Path* 2003; 12: 65-71.

129. Apple FS, Trinity E, Steen J, Prawer S, Wu AHB. BNP test utilization in CHF in community hospital practice. *Clin Chim Acta* 2003; 328: 191-3.
130. Gagajewski A, Apple FS. Methadone related deaths in Hennepin County, 1992-2002. *J Forens Sci* 2003; 48: 668-71.
131. Apple FS, Johari V, Hoybook KJ, Weber-Shrikant E, Davis GK, Murakami MM. Operationalizing cardiac troponin I testing along ESC/ACC consensus guidelines for defining myocardial infarction. *Clin Chim Acta* 2003; 331: 165-6.
132. Apple FS, Quist HE, Doyle PJ, Otto AP, Murakami MM. Plasma 99th percentile reference limits for cardiac troponin and creatine kinase MB mass for use with European Society of Cardiology/American College of Cardiology consensus recommendations. *Clin Chem* 2003; 49: 1331-6.
133. Apple FS, Murakami MM, Quist H, Pearce LA, Wieczorek S, Wu AHB. Prognostic value of the Ortho Vitros Troponin I assay in patients with symptoms of myocardial ischemia: risk stratification using ESC/ACC recommended cutoff values. *Am J Clin Path* 2003; 120: 114-20.
134. Gagajewski A, Apple FS. Amphetamines: role of toxicology testing for assisting in medical examiner cases. *J Clin Lig Assay* 2003; 26: 25-9.
135. Yeo KTJ, Wu ANB, Apple FS, Kroll MH, Christenson RH, Lewandrowski KB, Sedor FA, Butch AW. Multicenter evaluation of the Roche NT-proBNP assay and comparison to the Biosite BNP assay. *Clin Chim Acta* 2003; 338: 107-15.
136. Gagajewski A, Murakami MM, Kloss J, Edstrom M, Hiller M, Peterson GF, Amatuzio J, Apple FS. Measurement of chemical analytes in vitreous humor: stability and precision studies. *J Forens Sci* 2004; 49: 371-4.
137. Aslan D, Apple FS. Ischemia modified albumin: clinical and analytical update. *Lab Med* 2004; 35: 1-5.
138. Luepker RV, Apple FS, Christenson RH, Crow RS, Fortmann SP, Goff D, Goldberg RJ, Hand MM, Jaffe AS, Julian DG, Levy D, Manolio T, Mendis S, Mensah G, Pajak A, Prineas RJ, Reddy KS, Roger VL, Rosamond WD, Shahar E, Sharrett AR, Sorlie P, Tunstall-Pedoe H. Case definitions for acute coronary heart disease in epidemiology and clinical research studies. *Circulation* 2003; 108: 2543-9.
139. Apple FS, Quist H, Murakami MM. Diagnostic and prognostic value of Ortho Vitros Troponin I and Beckman Access AccuTnI assay in patients admitted with symptoms suggestive of acute coronary syndrome. *Arch Path Lab Med* 2004; 128: 430-4.
140. Lin JC, Apple FS, Murakami MM, Luepker RV. Rates of positive cardiac troponin I and creatine kinase MB among patients hospitalized for suspected acute coronary syndromes. *Clin Chem* 2004; 50: 333-8.
141. Panteghini M, Pagani F, Yeo KT, Apple FS, Christenson RH, Dati F, Mair J, Ravkilde J, Wu AHB. Evaluation of the imprecision at low range concentrations of the assays for cardiac troponin determination. *Clin Chem* 2004; 50: 327-32.
142. Panteghini M, Linsinger T, Wu AHB, Dati F, Apple F, Christenson RH, Mair J, Schimmel H. Standardization of immunoassays for measurement of myoglobin in serum. Phase I: evaluation of candidate reference materials. *Clin Chim Acta* 2004; 341; 65-72.

143. Apple FS, Kleinfeld AM, Adams III J. Unbound free fatty acid concentrations are increased in cardiac ischemia. *Clin Proteomics* 2004; 1: 169-72.
144. Ricchiuti V, Voss EM, Ney A, Odland M, Apple FS. Skeletal muscle expression of creatine kinase-B in end stage renal disease. *Clin Proteomics* 2004; 1: 161-7.
145. Apple FS, Murakami MM, Christenson RH, Campbell JL, Miller CJ, Hock KG, Scott MG. Analytical performance of the i-STAT cardiac troponin I assay. *Clin Chim Acta* 2004; 345: 123-7.
146. Wu AHB, Smith A, Apple FS. Optimum blood collection intervals for B-type natriuretic peptide testing in heart failure patients. *Am J Cardiol* 2004; 93: 1562-3.
147. Wu AHB, Smith A, Christenson RH, Murakami MM, Apple FS. Evaluation of a point of care assay for cardiac markers for patients suspected of acute myocardial infarction. *Clin Chim Acta* 2004; 346: 211-9.
148. Jaffe AS, Apple FS, Babdin L. Why we don't know the answer may be more important than the specifics (re: BNP). *Clin Chem* 2004; 50: 1495-7.
149. Apple FS, Murakami MM. Serum 99th percentile reference cutoffs for seven cardiac troponin assays. *Clin Chem* 2004; 50: 1477-9.
150. Apple FS, Murakami MM, Pearce LA, Herzog CA. Prognostic value of high sensitivity C-reactive protein, N-terminal proBNP, and cardiac troponin T and I in end stage renal disease for subsequent death over two years. *Clin Chem* 2004; 50: 2279-85.
151. Rosalki S, Roberts R, Katus HA, Giannitsis E, Ladenson JH, Apple FS. Cardiac biomarkers for detection of myocardial infarction: perspectives from past to present. *Clin Chem* 2004; 50: 2205-13.
152. Apple FS. Analytical issues for cardiac troponin. *Prog Cardiovas Dis* 2004; 47: 189-95.
153. Apple FS, Murakami MM. Cardiac troponin and creatine kinase MB monitoring during in-hospital myocardial reinfarction. *Clin Chem* 2005; 51: 460-3.
154. Apple FS, Panteghini M, Ravkilde J, Mair J, Wu AHB, Tate J, Pagani F, Christenson RH, Jaffe AS. Quality specifications for B-type natriuretic peptide assays. *Clin Chem* 2005, 51: 486-93.
155. Apple FS, Wu AHB, Mair J, Ravkilde J, Panteghini M, Tate J, Pagani F, Christenson RH, Mockel M, Danne O, Jaffe AS. Future biomarkers for detection of ischemia and risk stratification in acute coronary syndrome. *Clin Chem* 2005; 810-24.
156. Slack JA, McGuirk SM, Erb HN, Lien L, Coombs D, Semrad SD, Riseberg A, Marques F, Darien B, Murakami MM, Apple FS, Peek SM. Biochemical markers of cardiac injury in normal and surviving versus non-surviving septicemic neonatal foals. *Vet Med* 2005; 19: 577-580.
157. Apple FS. Standardization of cardiac markers. *Scand J Clin Lab Invest* 2005; 65 (suppl 240): 107-111.
158. Apple FS, Parvin CA, Buechler KF, Christenson RH, Wu AHB, Jaffe AS. Validation of the 99th percentile cutoff independent of assay imprecision (%CV) for cardiac troponin monitoring for ruling out myocardial infarction. *Clin Chem* 2005; 51: 2198-2200.
159. Apple FS, Ler R, Chung AY, Berger MJ, Murakami MM. Point-of -care i-STAT cardiac troponin I for assessment of patients with symptoms suggestive of acute

coronary syndrome. *Clin Chem* 2006; 52: 322-5.

160. St. Peter JV, Hartley GG, Murakami MM, Apple FS. (BNP) and N-terminal pro-BNP in obese patients without heart failure: relationship to body mass Index and gastric bypass surgery. *Clin Chem* 2006; 52: 680-5; Published February 23, 2006. doi: 10.1373/clinchem.2005062562

161. Apple FS. Point of care cardiac troponin testing: process improvements for detection of acute myocardial infarction. *Point of Care* 2006; 5: 11-15

162. Apple FS, Chung AY, Kogut ME, Bubany S, MurakamiMM. Decreased patient charges following implementaion of point-of-care cardiac troponin monitoring in acute coronary syndrome patients in a community hospital cardiology unity. *Clin Chim Acta* 2006;370:191-5.

163. Jaffe AS, Babuin L, Apple FS. Biomarkers in acute coronary disease: the present and the future. *J Am Coll Cardiol* 2006;48:1-11.

164. Christenson RH, Duh SH, Apple FS, Bodor GS, Bunk DM, Panteghini M, Welch MJ, Wu AHB, Kahn SE, for the AACC Cardiac Troponin I Standardization Committee. Toward standardization of cardiac troponin I measurements part II: assessing commutability of candidate reference materials and harmonization of cardiac troponin I assays. *Clin Chem* 2006; **52:** 1685 - 92.

165. Carson JL, Terrin ML, Magaziner J, Chaitman BR, Apple FS, Heck DA, Sanders D, for the FOCUS Investigators. Transfusion trigger trial for functional outcomes in cardiovascular patients undergoing surgical hip fracture repair (FOCUS). *Transfusion Medicine*, 2006; 46:2192-2206.

166. Thompson PD, Apple FS, Wu A. Marathoner's Heart? *Circulation* 2006;114:2306-8 (Editorial).

167. Hermsen D, Apple F, Garcia-Beltran L, Jaffe A, Karon B, Lewandrowski E, Muhlbacher A, Muller R, Ordonez J, Pagani F, Panteghini M, Plecko T, Jarausch J. Results from multicenter evaluation of 4th generation Elecsys troponin T assay. *Clin Lab* 2007;53:1-9.

168. Apple FS. Cardiac troponin monitoring for detection of myocardial infarction: newer generation assays are here to stay. *Clin Chim Acta* 2007;380:1-3.\

169. Apple FS, Pearce LA, Doyle PJ, Otto AP, Murakami MM. Cardiac troponin risk stratification based on 99th percentile reference cutoffs in patients with ischemic symptoms suggestive of acute coronary syndrome: influence of estimated glomerular filtration rates. *Am J Clin Path* 2007;127:598-603.

170. Liang F, O'Rear J, Schellenberger U, Tai L, Lascecki M, Scheiner GF, Apple FS, Maisel AS, Pollitt NS, Protter AA. Evidence for functional heterogeneity of circulating B-type natriuretic peptide. *J Am Coll Cardiol* 2007;49:1071-8.

171. Seferian KR, Tamm NN, Semenov AG, Mukharyamova KS, Tolstaya AA, Koskina EV, Kara AN, Krasnoselsky MI, Apple FS, Esakova TV, Filatov VL, Katrukha AG. The brain natriuretic peptide precursor proBNP is the major immunoreactive form of BNP in patients with heart failure. *Clin Chem* 2007; 53:866-73.

172. Apple FS, Pearce LA, Chung A, Ler R, Murakami MM. Multiple biomarker use for detection of adverse events in patients presenting with symptoms suggestive of acute coronary syndrome. *Clin Chem* 2007;53:874-81.

173. Apple FS, Jesse RL, Newby LK, Wu AHB, Christenson RH. National Academy of Clinical Biochemistry and IFCC Committee for Standardization of Markers of

Cardiac Damage Laboratory Medicine practice guidelines: analytical issues for biomarkers of acute coronary syndromes. *Circulation* 2007;115:e352-5.

174. Apple FS, Jesse RL, Newby LK, Wu AHB, Christenson RH. National Academy of Clinical Biochemistry and IFCC Committee for Standardization of Markers of Cardiac Damage Laboratory Medicine practice guidelines: analytical issues for biomarkers of acute coronary syndromes. *Clin Chem* 2007;53:547-51.

175. Thompson JG, Baker AM, Bracy AH, Seningen J, Kloss JS, Strobl Q, Apple FS. Fentanyl concentrations in 23 postmortem cases from the Hennepin County Medical Examiner's Office. *J Forensic Sci* 2007; 52:978-81.

176. Lee-Lewandrowski E, Januzzi JL, Green SM, Tannous B, Wu AHB, Smith A, Wong A, Murakami MM, Kaczmarek J, Apple FS, Miller WL, Hartman K, Jaffe AS. Multi-center validation of the Response Biomedical Corporation RAMP NT-proBNP assay with comparison to the Roche Diagnostics GmbH Elecsys proBNP assay. *Clin Chim Acta* 2007;386:20-24.

177. Thygesen K, Alpert JS, White HD, Jaffe AS, Apple FS, Galvani M, Katus HA, Newby LK, Ravkilde J, Chaitman B, Clemmensen PM, Dellborg M, Hod H, Porela P, Underswood R, Bax JJ, Beller GA, Bonow R, Van Der Wall EE, Bassand JP, Wijns W, Ferguson TB, Steg PG, Uretsky BF, Williams DO, Armstrong PW, Antman EM, Fox KA, Hamm CW, Ohman EM, Simoons ML, Poole-Wilson PA, Gurfinkel EP, Lopez-Sendon JL, pais P, Mendis S, Zhu JR, Wallentin LC, Fernandez-Aviles F, Fox KM, Parkhomenko AN, Priri SG, Tendera M, Voipio-Pulkki LM, on behalf of the Joint ESC/ACCF/AHA/WHF Task Force for the redefinition of myocardial infarction. Universal definition of myocardial infarction. *Europ Heart J* 2007;28:2525-38.

178. Thygesen K, Alpert JS, White HD, Jaffe AS, Apple FS, Galvani M, Katus HA, Newby LK, Ravkilde J, Chaitman B, Clemmensen PM, Dellborg M, Hod H, Porela P, Underswood R, Bax JJ, Beller GA, Bonow R, Van Der Wall EE, Bassand JP, Wijns W, Ferguson TB, Steg PG, Uretsky BF, Williams DO, Armstrong PW, Antman EM, Fox KA, Hamm CW, Ohman EM, Simoons ML, Poole-Wilson PA, Gurfinkel EP, Lopez-Sendon JL, pais P, Mendis S, Zhu JR, Wallentin LC, Fernandez-Aviles F, Fox KM, Parkhomenko AN, Priri SG, Tendera M, Voipio-Pulkki LM, on behalf of the Joint ESC/ACCF/AHA/WHF Task Force for the redefinition of myocardial infarction. Universal definition of myocardial infarction. *J Am Coll Cardiol* 2007;50:2173-95.

179. Apple FS, Murakami MM. Serum and plasma cardiac troponin I 99th percentile reference values for 3 2nd-generation assays. *Clin Chem* 2007;53:1558-1560.

180. Wu AHB, Jaffe AS, Apple FS, Jesse RL, Francis GL, Morrow DA, Newby LK, Ravkilde J, Wilson WH Tang, Christenson RH. National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines: use of cardiac troponin and B-type natriuretic peptide or N-terminal proB-type natriuretic peptide for etiologies other than acute coronary syndromes and heart failure. *Clin Chem* 2007;53:2086-2096.

181. Johnen H, Lin S, Kuffner T, Brown DA, Wang V, Bauskin AR, Pankhurst L, Jiang L, Junankar S, Hunter M, Fairlie W, Lee NJ, Enriquez R, Baldock PA, Corey E, Apple FS, Murakami MM, Lin E, Wang C, During MJ, Sainsbury A, Herzog H, Breit SN. Tumour-induced anorexia and weight loss is mediated by the TGF-beta

superfamily cytokine MIC-1. *Nature Medicine* 2007;13:1333-40.

182. Tang WHW, Francis GS, Morrow DA, Newby LK, Cannon CP, Jesse RL, Storrow AB, Christenson RH, Apple FS, Ravkilde J, Wu AHB. National Academy of Clinical Biochemistry practice guidelines: clinical utilization of cardiac biomarker testing in heart failure. *Circulation* 2007;116:e99-109.

183. Morrow DA, Cannon CP, Jesse RL, Newby LK, Ravkilde J, Storrow AB, Wu, AHB, Christenson RH, Apple FS, Francis G, Tang W. National Academy of Clinical Biochemistry practice guidelines: clinical characteristics and utilization of biomarkers in acute coronary syndromes. *Clin Chem* 2007;53:552-74.

184. Apple FS, Wu AHB, Jaffe AS, Panteghini M, Christenson RH. National Academy of Clinical Biochemistry and IFCC Committee for Standardization of Markers of Cardiac Damage Laboratory Medicine practice guidelines: analytical issues for biomarkers of heart failure. *Circulation* 2007; 116:e95-98.

185. Storrow AB, Apple FS, Wu, AHB, Jesse RL, Francis GS, Christenson RH, et al. National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines: Point of care testing, oversight, and administration of cardiac biomarkers for acute coronary syndromes. *Point Care: J Near Patient Test Technol* 2007;6:215-222.

186. Apple FS, Wu AHB, Jaffe AS, Panteghini M, Christenson RH. National Academy of Clinical Biochemistry and IFCC Committee for Standardization of Markers of Cardiac Damage Laboratory Medicine practice guidelines: analytical issues for biomarkers of heart failure. *Clin Biochem* 2008;41:222-6.

187. Tang WHW, Francis GS, Morrow DA, Newby LK, Cannon CP, Jesse RL, Storrow AB, Christenson RH, Apple FS, Ravkilde J, Wu AHB. National Academy of Clinical Biochemistry practice guidelines: clinical utilization of cardiac biomarker testing in heart failure. *Clin Biochem* 2008;41:210-21..

188. Apple FS, Smith SW, Pearce LA, Ler R, Allex E, Murakami MM. Detection of adverse events in patients presenting with symptoms suggestive of acute coronary syndrome utilizing the Bayer Advia Centaur TnI – Ultra assay. *Clin Chem* 2008; 54:723-728.

189. Apple FS, Smith SW, Pearce LA, Murakami MM, Benoit M, Levy C, Paul J. Use of the bioMerieux VIDAS troponin I Ultra assay for the diagnosis of myocardial infarction and detection of adverse events in patients presenting with symptoms suggestive of acute coronary syndrome. *Clin Chim Acta* 2008; 2008:72-5.

190. Luckenbill K, Ler R, Murakami MM, Christenson R, Jaffe AS, Mair J, Ordonez J, Pagani F, Tate J, Wu A, Apple FS. Crossreactivity studies of BNP, NT-proBNP, and proBNP in commercial BNP and NT-proBNP assays: preliminary observations from the IFCC committee for Standardization of Markers of Cardiac Damage. *Clin Chem* 2008;54:619-21.

191. Peacock WF, De Marco T, Fonarow GC, Diercks D, Wynne J, Apple FS, Wu AHB, for the ADHERE scientific advisory committee study group. Cardiac troponin and heart failure outcome in acute heart failure. *New Eng J Med* 2008; 358: 2117-26.

192. Seferian KR, Tamm NN, Semenov AG, Tolstaya AA, Koshkina EV, Krasnoselsky MI, Postnikov AB, Serebryanaya DV, Apple FS, Murakami MM, Katrukha AG. Immunodetection of glycosylated NT-proBNP circulating in human blood. *Clin Chem* 2008; 54:866-873.